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INTERIM REMEDIAL MEASURES WORKPLAN
INSTALLATION OF A GROUND WATER EXTRACTION AND TREATMENT SYSTEM
N. FIVE MILE ROAD AREA

SEPTEMBER 5, 1994

PREPARED BY:

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1.0 INTRODUCTION

Van Waters & Rogers Inc. (VW&R) operated a small distribution facility from a portion of a warehouse located on former Friedly Drive, Boise, Idaho from approximately 1973 to 1983. Perchloroethylene, or perc, was stored in a 6000 gallon aboveground tank and repackaged into smaller containers for distribution. The area downgradient of the former VW&R facility where ground water has been impacted by perc is known as the Affected Area and has been determined to extend to approximately N Five Mile Road (HLA, 1993a). The Affected Area is defined as the area where perc concentrations in ground water exceed the Safe Drinking Water Act Maximum Contaminant Level (MCL) of 5 micrograms per liter (ug/L) proposed by the U.S. Environmental Protection Agency (USEPA).

VW&R proposes to implement Interim Remedial Measures in the N. Five Mile Road area to inhibit the downgradient migration of perc-containing ground water in the shallow aquifer. These measures include installation and operation of a ground water extraction and treatment system. A description of the proposed remedial measures and approximate implementation schedule are described in this work plan. Provisions for monitoring and evaluating the effectiveness of the remedial measures are also described in this work plan.

2.0 BACKGROUND

2.1 Site Location and Description

The proposed interim remedial measures will be implemented at the downgradient edge of the Affected Area approximately 1100 feet north of Fairview Avenue in the vicinity of the intersection of Fairview Avenue and N. Five Mile Road. The N. Five Mile Road area is primarily a residential area consisting of single family homes. Irrigation canals, operated by the Nampa & Meridian Irrigation District, are also located in this area. To the extent possible, locations of the integral components of the ground water extraction and treatment system are depicted on Figure 1.

2.2 Site Hydrogeology

The shallow regional geology consists of 50 to 150 feet of unconsolidated silt, sand, and gravel of Pleistocene Age, referred to as older terrace gravels, that have been reworked and deposited by the Boise River (Dion, 1972). These older terrace gravels comprise[rise the shallow aquifers in the area. Underlying and separated from the older terrace gravels by an unconformity is the Glenns Ferry Formation of Late Pliocene to Early Pleistocene Age. The Glenns Ferry Formation is composed of interbedded clay, silt, sand, fine gravel, and basalt up to 2,000 feet thick (Dion, 1972).

A shallow aquifer in the vicinity is present under water table conditions at an approximate depth of 8 to 15 feet below ground surface (bgs). Localized ground water recharge and discharge vary seasonally. Recharge generally occurs from the Ridenbaugh Canal, Farmers Lateral south of the site, and local agricultural irrigation in the vicinity of the Mall during the irrigation season between April and October. However, localized ground water discharge to the Finch lateral (previously known as the South Slough) in offsite downgradient areas has been observed (HLA, 1993b). Although water levels and flow direction may fluctuate with the irrigation season, the predominant regional flow direction in the shallow aquifer is to the northwest. The presence of an aquitard separating the upper aquifer from the lower Glenns Ferry aquifer system is unconfirmed for the West Boise Area. However, data from well logs suggest that aquitards or lower permeability units are laterally discontinuous in the West Boise area.

The deep aquifer system lies in the sand, gravel, and basalt of the Glenns Ferry Formation and has been reported as a confined aquifer (Mink and LeBaron, 1976). The deep aquifer is recharged primarily from infiltration of precipitation and snowfall along the foothills and ridge areas and potentially from the shallow aquifer. Ground water removal from the aquifer is primarily from the Boise Water Corporation for domestic and industrial use. Aquifer studies indicate a transmissivity of approximately 15,750 gallons per day per foot and a storage coefficient of 0.02 (Mink and LeBaron, 1976).

2.3 Site Hydrogeology

The shallow geology in the vicinity consists of approximately 30 feet to 60 feet of terrace gravels that have been reworked and deposited by the Boise River. Underlying these terrace deposits are medium-to-coarse-grained sands interbedded with silts and clays. According to the well log for the Boise Water Corporation Bali Hai well, located approximately one-half mile north northwest of the Site, the uppermost sediments consist of 30 feet of sandy gravel beneath which are 105 feet of silty sand. Below the silty sand at a depth of approximately 135 feet below ground surface is 75 feet of "blue" clay.

A seismic reflection pilot study conducted by Harding Lawson Associates (HLA) for VW&R during April 1993 at the Site resulted in the detection of a weak reflector, indicating a subtle change in lithology such as from a coarse sand to a fine sand, at a depth of approximately 100 feet and a series of stronger reflectors beginning at a depth of approximately 150 feet. Results of the seismic reflection pilot study are summarized in HLA's letter to the Idaho Department of Health and Welfare dated May 6, 1993 (HLA, 1993c). A strong reflector may indicate the presence of a clay layer. The seismic reflection data combined with the Bali Hai well log would suggest that the layer of "blue" clay found at a depth of approximately 135 feet at the Bali Hai well may be present at the Site at a depth of approximately 150 feet.

A shallow water table aquifer is present at the Site at a depth of approximately 15 feet to 20 feet below ground surface. The predominate regional flow direction in this shallow aquifer is to the northwest. Some localized fluctuations in the depth to the water table is expected during the irrigation season that begins in mid-April and ends in October. Generally, recharge to the shallow water table aquifer occurs during the irrigation season resulting in up to a three to five foot rise in the water table. Ground water discharge to the canals and sloughs has also been observed during the irrigation season.

Hydraulic characteristics of the water table aquifer in the vicinity of the Site are not known; however, short-duration pumping tests have been conducted in the water table aquifer at an upgradient location by Special Resources Management (SRM). Results of this testing were reported in January 13, 1989 SRM report entitled "Groundwater Remedial Action Plan for the Westpark Commercial Center, Boise Idaho" (SRM, 1989). Transmissivity values for wells having depths of 41 feet to 47 feet ranged from 11,475 gallons per day per foot (gpd/day/ft) to 43,000 gpd/day/ft. A storativity value of 0.03 was obtained and is based on data collected during a 12-hour pumping test.

3.0 FIELD INVESTIGATIONS

VW&R and its consultant, HLA, have delineated the horizontal extent of the Affected Area through collection and analysis of ground water samples from domestic water supply wells in the West Boise area. The extent of the Affected Area is monitored on a quarterly basis through collection and analysis of ground water samples from selected domestic water supply wells. Additionally, a seismic reflection pilot study was conducted at the downgradient edge of the Affected Area and a ground water monitoring well, known as the Sunrise Well, was installed between the Affected Area and the Bali Hai water supply well.

3.1 Delineation of the Affected Area

Ground water analytical data collected by the Department and others were used to initially define a geographical area in West Boise within which ground water may have been affected by perc. The boundaries of this area, known as the Preliminary Affected Area or PAA, encompassed a much larger area than the area suspected to have been impacted. Subsequent investigative activities conducted by VW&R and HLA have resulted in delineation of an area within the PAA where perc concentrations in ground water exceed the Safe Drinking Water Act Maximum Contaminant Level of 5 ug/L.

VW&R conducted two rounds of ground water sampling in the PAA. The initial sampling round was conducted in August 1992. Results of this round were presented in HLA's November 17, 1992 report entitled "Initial Groundwater sampling Report, Preliminary Affected Area, Water Supply Order, Boise, Idaho" (HLA, 1992a). Perc was detected in 11 of the 28 samples collected during the initial sampling round with concentrations ranging from 1.6 ug/L to 750 ug/L. Six of the 28 wells sampled contained perc at concentrations greater than the analytical detection limit but less than the MCL of 5 ug/L.

An additional sampling round was conducted during February 1993 to further define the Affected Area and to provide data for establishing baseline concentrations. Fifteen wells were sampled during this sampling round. Analytical results were presented in HLA's March 25, 1993 "Quarterly Progress Report, January through March, 1993, Boise Idaho" (HLA, 1993d).

Analytical data from the August 1992 and February 1993 sampling rounds were collectively evaluated to identify the Affected Area. A total of 49 data points, including 39 domestic wells and 10 ground water monitoring wells, were evaluated. Of these, twelve domestic well and three monitoring well samples contained perc at concentrations greater than the analytical detection limit but less than the MCL of 5 ug/L. Eighteen domestic well and three monitoring well samples did not contain perc. The remaining nine domestic well samples contained perc at concentrations ranging from 5.9 ug/L to 750 ug/L. The remaining four monitoring well samples contained perc at concentrations ranging from 450 ug/L to 3,000 ug/L. These data were used to delineate the Affected Area as depicted on Figure 1. The Affected Area boundary line is extrapolated between sampling locations where perc was not detected and locations where it was detected. The configuration of the Affected Area is monitored quarterly through collection and analysis of ground water samples from select domestic wells. The Affected Area may be modified in the future based on the quarterly analytical data.

3.2 Seismic Reflection Pilot Study

A seismic reflection pilot study was conducted at the Site during April 1993 to evaluate the suitability fro conducting a full scale seismic reflection survey at the site and to determine optimum operating characteristics for the survey. As a result of this pilot program, hydrogeologic data was collected to assist in the characterization of the Site. Seismic reflection testing was performed using an EG&G Geometrics Model ES-2401 exploration seismograph and 48 groups of Mark Products, L28E geophones spaced at 2-foot intervals. Two seismic energy sources were utilized during the test: a 16-pound sledge hammer striking an aluminum plate placed on the ground and a 12-gauge, 165 grain blank shotgun shell percussion rod placed at an approximate depth of 1.5 feet below ground. During data collection activities, filters were used to evaluate optimum recording parameters. The results of the pilot study were reported in the Geophysical Sampling and Analysis Plan dated May 6, 1993 (HLA, 1993c).

Data from the seismic reflection pilot study suggests a weak reflector at an approximate depth of 100 feet. A series of strong reflectors begins at an approximate depth of 150 feet. A reflecting horizon represents a change in lithology. A strong reflector may indicate the presence of a clay layer whereas a weak reflector may represent a more subtle change in lithology such as from a coarse sand to a fine sand.

3.3 Installation of the Sunrise Monitoring Well

A ground water monitoring well was installed between the downgradient edge of the Affected Area and the Bali Hai water supply well. The well was installed at 2212 N. Sunrise Avenue and, therefore, is known as the Sunrise Well. The well's location is depicted on Figure 2. The purpose of the well is to monitor ground water quality and to evaluate the influence, if any, pumping the Bali Hai well has on the shallow aquifer.

Well construction was accomplished by first drilling a 10-inch diameter borehole to a depth of fifty feet using hollow-stem auger drilling techniques. A lithologic log, based on the drill cuttings, was prepared by HLA. Sand and gravel were the only materials encountered during drilling of the borehole. Ground water was encountered at a depth of approximately 16 feet. Lithologic and well construction logs for the Sunrise Well are included in Appendix A.

Ground water samples were collected at 10-foot intervals commencing at 20 feet using a Hydropunch™ sampler to characterize ground water quality with depth. Halogenated VOCs were not detected in any of the samples or in the trip blank at concentrations greater than the laboratory reporting limit of 0.5 ug/L. Based on these data and discussions with the Department, the well was completed to a depth of 40 feet with a screened interval extending from 20 feet to 40 feet. The Sunrise Well consists of 20 feet of 0.010-inch, 4-inch diameter Schedule 40 PVC screen and 20 feet of 4-inch diameter flush joint, threaded Schedule 40 PVC casing. A sand pack extends from the bottom of the well to approximately three feet above the top of the screen. A 1 1/2-foot thick bentonite pellet seal was formed above the sand pack. Granular bentonite was used to fill the remaining annulus. The well was completed at grade with a bolted flush-mount well box. A locking well cap was fitted to the well casing.

The well was developed on March 9, 1994 followed by collection of ground water samples. These samples were analyzed for halogenated VOCs utilizing EPA Method 8010. Perc was detected in each of the samples collected at a concentration of 0.3 ug/L. Other VOCs were not detected in the samples. A ground water sample collected from the well on May 19, 1994 resulted in the detection of perc at a concentration of 0.7 ug/L.

The well was equipped with a transducer and data logger during may 1994 to collect and record water level data necessary to evaluate what impact, if any, pumping the Bali Hai well has on the shallow aquifer. The equipment was programmed to measure and record water levels in the well on an hourly basis. Data will be retrieved at the end of each month and evaluated.

4.0 TECHNICAL APPROACH

4.1 Objectives

VW&R proposes to install and operate a ground water extraction and treatment system at the downgradient end of the Affected Area to mitigate the migration of perc-containing ground water. The hydraulic barrier resulting from operation of the system will inhibit further migration of ground water thereby ensuring protection of the shallow aquifer that is the source of potable water for many residents in the area. VW&R has successfully implemented similar ground water extraction and treatment technologies at other locations to effectively contain and remove VOCs from ground water.

4.2 Methodology

Ground water containing perc will be captured at the downgradient end of the Affected Area through the pumping of strategically located extraction wells. The hydraulic characteristics of the aquifer, optimal pumping rate of each well, and resulting capture zones will be evaluated by performance of an aquifer test.

The ground water extraction and treatment system will consist of two extraction wells, four monitoring wells, and treatment utilizing a carbonaceous material to remove VOCs from ground water prior to discharge. The extraction wells will be constructed in accordance with the provisions described in HLA's work plan entitled " Soil Boring Sampling and Analysis Plan, Preliminary Study Area Order, Boise, Idaho" (HLA, 1993e). Monitoring wells will be constructed as described herein at select locations to provide data to evaluate the effectiveness of the extraction system.

The methodology proposed in this work plan is widely accepted as "state-of-the-art" technology for accomplishment of the stated objective. Site-specific conditions will govern the design and operation of the system.

4.3 Installation and Sampling of Monitoring Wells

Four monitoring wells will be constructed at locations depicted on Figure 2 to provide data to evaluate the effectiveness of the extraction system. Boreholes for each monitoring well will be advanced to a depth of 40 feet using hollow-stem auger drilling techniques. Soil samples will be collected at five foot intervals using a split spoon sampler for purposes of lithologic logging. A monitoring well, consisting of a 25-foot long 0.010-inch, 2-inch diameter Schedule 40 PVC screen and 15 feet of 2-inch diameter flush joint, threaded Schedule 40 PVC casing, will be constructed in each borehole. A sand pack will be emplaced around the well screen to approximately three feet above the top of the screen. A 2-foot thick bentonite pellet seal will be constructed above the sand pack. Granular bentonite will be used to fill the remaining annulus. The well will be completed at grade with a bolted flush-mount well box and fitted with a locking cap.

Each monitoring well will be developed to promote ground water flow to the well and to remove fine-grained material that may have been introduced to the well's sand pack. Well development will commence no sooner than 24 hours following completion of each well and will be accomplished by a combination of surging and bailing. The pH, specific conductivity, and temperature of the water removed from the well during development activities will be measured. Well development will be considered complete when these parameters stabilize (i.e., parameter measurements are within 10 percent of each other) and the purged water is essentially free of sediment.

Ground water samples will be collected from each monitoring well and analyzed for VOCs utilizing EPA Method 8010. Ground water sampling will commence no sooner than 72 hours following well development activities and will be in accordance with the QAPP (HLA, 1992,b). A ground water sample will be collected using either a stainless steel or teflon bailer after three well volumes of water have been removed from the well. The pH, specific conductance, and temperature of the ground water will be measured as part of the sampling activities. All ground water samples will be delivered under proper chain of custody procedures to Analytical Technologies Incorporated, located in Renton, Washington, for VOC analysis.

4.4 Operational Concept

Ground water will be extracted from two 8-inch diameter stainless steel wells located along N. Five Mile Road (Figure 2). An aquifer testing program consisting of a step-drawdown test and pumping test, will be conducted to: 1) evaluate optimum pumping rates; 2) evaluate the hydraulic characteristics of the aquifer; and, 3) provide the data necessary to predict the capture zone resulting from various pumping rates.

4.4.1 Aquifer Testing Program

The success of any aquifer testing program is highly dependent on an understanding of the hydraulic system being evaluated. Because the shallow aquifer system in west Boise has the potential to be very dynamic due to the permeable nature of the sediments and rapid influences from local irrigation, water level trends will be evaluated prior to and following the testing program. This will be accomplished through collection of static water level data the week prior to and following the aquifer test.

The step drawdown test will be conducted by pumping one of the extraction wells at several successively higher pumping rates and recording the resultant drawdown for each rate. The test will be conducted in a single day and the pumping times for each discharge rate will be the same. Up to five pumping rates will be used, each lasting 2 hours. Anticipated pumping rates will include 20, 40, 60, 80, and 100 gallons per minute (gpm). Drawdown will be measured using a data logger and transducer installed in the extraction well. In addition, hand measurements will be made using an electric water level meter. The pumping rate will be measured using a commercially available meter.

Data obtained from the step-drawdown test will be evaluated using the graphical method presented by Bierschenk (1964).

A 24-hour constant rate pumping test will be conducted after the water levels have returned to static conditions but no sooner than 12 hours following completion of the step-drawdown test on the same well utilized for the step drawdown test. The objective of the pumping test will be to characterize the hydraulic properties of the aquifer and will be accomplished by pumping the well at the optimum rate as determined from the step-drawdown test and measuring the resulting drawdown in the pumped well and nearby monitoring wells. Drawdown will be measured using a data logger and transducers installed in the extraction well and select monitoring wells. In addition, hand measurements will be made using an electric water level meter. The pumping rate will be measured using a commercially available meter.

A 8-hour recovery test will be conducted following the constant-rate pumping test. Recovery measurements will be made in the pumped well and monitoring wells at the same frequency as during the pumping portion of the aquifer test.

Time-drawdown data collected during the constant-rate pumping test will be evaluated using a solution developed by Neuman (1975) or other applicable solution that accounts for partially penetrating pumping and monitoring wells to determine the aquifer's hydraulic characteristics.

4.4.2 Capture Zone Analysis

A ground water extraction system that is effective in achieving the objectives of this IRM requires an understanding of the capture zone that results from pumping a well and how it compares with the desired capture width. It is therefore essential top determine the well's capture zone and to tailor it to match the desired capture width. To accomplish this, the hydraulic characteristics of the aquifer will be used in an analytical capture zone model to identify an effective extraction system configuration and predict the resultant capture zone. The extraction wells will then be pumped at the rate predicted by the model to achieve the desired capture zone. The effectiveness of the extraction system in creating the required capture zone will be assessed through collection and evaluation of water level data from the system's ground water monitoring wells.

4.4.3 Ground Water Treatment System

The treatment system will include facilities for the extraction of ground water, treatment of recovered ground water, and discharge of treated water.. Key operating parameters are summarized below:

Ground Water Extraction -	
Recovery wells	2 each
Flow rate (subject to confirmation)	100 gpm per well
Depth to ground water	10 to 15 feet
Estimated drawdown (subject to confirmation)	25 feet
Transmission line diameter	4 inches
Water Treatment System -	
Design flow rate	300 gpm (0.67 cfs)
Average flow rate	200 gpm (0.45 cfs)
Maximum influent quality	10 ug/L total VOCs
Effluent quality	<1 ug/L total VOCs
System operation	24 hr/day, 7 days/week
Treated Water Discharge -	
Design flow rate	300 gpm
Average flow rate	200 gpm
Discharge location	Sargent Drain
Transmission line diameter	6 inches

The ground water extraction portion of the system includes the two wells and their transmission piping. An application will be made to the State of Idaho to appropriate public waters of the State upon finalizing the agreements with property owners on whose properties the extraction wells will be located. Each of the recovery wells will contain a submersible pump which will transmit ground water to the treatment system through a 4-inch-diameter transmission line. A reinforced concrete vault will contain the well head, associated piping, and an electrical disconnect for the well pump. Each well will be equipped with a transducer, located above the intake of the submersible pump. The transducer will continuously monitor the water level in the well and transmit the data to the treatment system.

The ground water treatment portion of the system, to be sited at a location to be determined, includes an influent tank, a process feed pump, an inlet filter, four volatile organic compound adsorption vessels, a discharge filter, a holding tank, and a discharge pump. The treatment system's process flow diagram is depicted on Drawing 1. An air compressor will provide power to operate valves and assist in periodic maintenance. The treatment equipment will be housed in a building equipped with personnel and service doors, heating and ventilation, electrical and control cabinet, and maintenance and storage areas. The building's floor slab will be configured to provide secondary containment of the water treatment facilities within. The secondary containment will have a sump and pump to transfer wash water to the inlet tank.

The adsorption vessels will contain a carbonaceous adsorbent resin known as Ambersorb™ that was developed by Rohm and Haas Company. VW&R will conduct a pilot test using Ambersorb at the Westpark site to demonstrate the effectiveness of the resin in removing VOCs from ground water. The test will consist of passing the effluent stream from the Westpark air stripper through a resin pilot system developed by VW&R. The effluent stream flow rate will be incrementally increased during the test. Samples will be collected prior to and after the resin vessel and analyzed for VOCs utilizing EPA Method 8010. In the event use of this resin becomes impractical, granular activated carbon (GAC) will be substituted. This resin was originally designed for use in treating water for potable applications. Ambersorb, consisting of hard, black, spherical beads, has unique properties that result in superior performance for a diverse range of liquid and vapor phase applications. One such application is ground water remediation. Ambersorb has significant performance advantages over other adsorbents such as granular activated carbon (GAC) and include:

- 5 to 10 times the capacity of GAC for removal of organic compounds

- Higher hydraulic loading rates (five to ten times higher) than are typical for GAC and maintain effluent water quality which meets drinking water standards

- Not prone to bacterial fouling and are more resistant to fouling by naturally occurring organic matter such as humic and fulvic acids

- Can be regenerated insitu (no regeneration will be performed at N. Five Mile Road)

Extracted ground water will be treated using Ambersorb to remove VOCs prior to its discharge to the Sargent Drain located approximately one-half mile north of the northernmost extraction well. The Nampa-Meridian Irrigation District (District) has provided conceptual approval of this discharge subject to terms and conditions of a license agreement. Details of the agreement are being developed by the District and VW&R.

The entire treatment process, from extraction through discharge, will be controlled and monitored by an on-site programmable logic controller (PLC). The PLC is computer controlled and allows data to be obtained and recorded automatically from instruments and process control hardware. Similarly, the PLC can communicate with process control hardware to optimize system operation, detect alarm situations, and shut the entire system down if necessary. The PLC can be accessed by an offsite computer to acquire stored data. Control and data acquisition are summarized as follows:

Process Control -
- Measure well water level
- Measure well discharge (flow) rate
- Measure influent tank liquid level
- Control process feed pump flow rate (by pump speed control)
- Measure pressure drop across the inlet filter
- Measure pressure drop across the VOC adsorption vessels
- Measure pressure drop across the outlet filter
- Measure liquid level in the secondary containment sump
- Operate the sump pump

Data Acquisition -
- Record well water level
- Record well discharge rate
- Record process feed pump operation hours
- Record pressure drop data

The treatment system will be configured with specific safeguards that will be continuously monitored by the PLC. Should a critical alarm condition occur, the PLC will automatically shut the entire system down. Safeguards, described in more detail below, will include the following:

- Underground piping sloped toward the extraction wells
- Continuous monitoring of the underground piping and pumping system
- Sump float switch
- High level alarms
- Secondary containment within the treatment building
- Remote monitoring system

Underground piping used to transmit extracted ground water to the treatment building will be sloped toward the extraction wells to allow evacuation of the piping in the event of a system shut down. Although underground piping will be installed below the frost line, implementation of this safeguard assures that piping breaks due to freezing water will not occur. The integrity of the piping will be monitored continuously by comparing the actual measured flow rate of fluid through the piping with the preset pumping rate. Differences between these parameters may indicate an integrity problem and would result in a system alarm and shutdown. Additionally, the amperage for the pump will be continuously monitored and, should anomalous readings be obtained, shut down of the system would occur.

The treatment equipment and building will be configured with safeguards that will shut the entire system down should an alarm condition occur. For example, the treatment equipment will be housed within a building whose floor will be designed to serve as secondary containment. The floor of the building will be sloped toward a sump equipped with a sensor that will provide an alarm and shut the system down should water accumulate above a predetermined level. High level alarms and shut off will also be utilized on each water accumulation vessel.

5.0 GROUND WATER MONITORING AND REPORTING

The effectiveness of the ground water extraction system will be assessed through collection and evaluation of water level data from the four monitoring wells depicted on Figure 2 These data will be used to create a potentiometric map for comparison with the results of the capture zone modeling described in this work plan. In addition, ground water samples will be collected for VOC analysis utilizing EPA Method 8010. These data will be collected and reported to the Department on a quarterly basis. The report will include data collection methodologies, summary data tables and figures.

6.0 DISCHARGE MONITORING

The chemical quality of treated ground water will be monitored to ensure it is discharged in accordance with the conditions of the discharge permit to be obtained. VW&R is completing the applications for the U.S. EPA's Consolidated Permits Program (Form 3510-1) and Facilities Which Do Not Discharge Process Wastewater (Form 3510-2E). VW&R anticipates submittal of these applications upon finalizing the license agreement with the Nampa-Meridian Irrigation District. VW&R will collect samples of the treated water for VOC analysis utilizing EPA Method 8010. At system startup, a sample of the treated water will be collected after eight hours of operation. The system will then be shut down pending receipt of analytical data demonstrating compliance with the conditions of the permit, at which time operation of the system will recommence. Samples of treated water will be collected on a weekly basis for the first month of operation and monthly for the following two months. After the first quarter of operation, the discharge monitoring frequency will be on a quarterly basis. Analytical data will reported to the Department on a quarterly basis.

7.0 PROJECT PERSONNEL

All phases of this project will be conducted by, or under the direct supervision of VW&R senior professional personnel. All senior personnel proposed have previous experience on this or similar projects for VW&R and were selected for their particular capabilities, expertise, and knowledge. Experienced sampling personnel will be selected from either Harding Lawson Associates or other qualified environmental consultant.

8.0 HEALTH AND SAFETY

All on-site activities will be conducted under the supervision of senior project personnel and in strict accordance with an approved Health & Safety Plan. On-site project personnel of VW&R and its subcontractors will be required to read and adhere to the provisions of the project Health & Safety Plan.

Specific health and safety issues regarding the operation of the various components of the treatment system will be addressed in the operation manual for the system. No personnel will be allowed to operate any equipment unless thoroughly trained in their operational and emergency shut-off procedures.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

QA/QC procedures will be employed during all sampling activities to ensure that the analytical results for ground water and treated water samples are accurate, consistent, and representative of actual site conditions. All activities will be conducted under the supervision of VW&R personnel and in accordance with the Department approved Quality Assurance Project Plan (HLA, 1992b).

Construction activities associated with the proposed ground water extraction and treatment system, will be under the supervision of VW&R project personnel. The building housing the treatment equipment will be designed and constructed by a local engineering firm; the treatment equipment by a firm experienced in the fabrication these systems. During the construction process, random inspections will be conducted by VW&R to ensure compliance with the project specifications. A final inspection of the completed building and treatment equipment will conducted prior to acceptance by VW&R.

10.0 IMPLEMENTATION SCHEDULE

VW&R will implement the IRM activities described in this work plan in accordance with the schedule presented on Figure 3. The schedule presented is based on the following assumptions:

* Access is acquired for siting the treatment system by August 1

* A license agreement with the Nampa Meridian Irrigation District for discharge of treated water is signed by August 1

* Local building permits are obtained by October 1

The actual schedule will be influenced by acceleration and/or delays in fulfilling the above assumptions and will require adjustment accordingly.

11.0 REFERENCES

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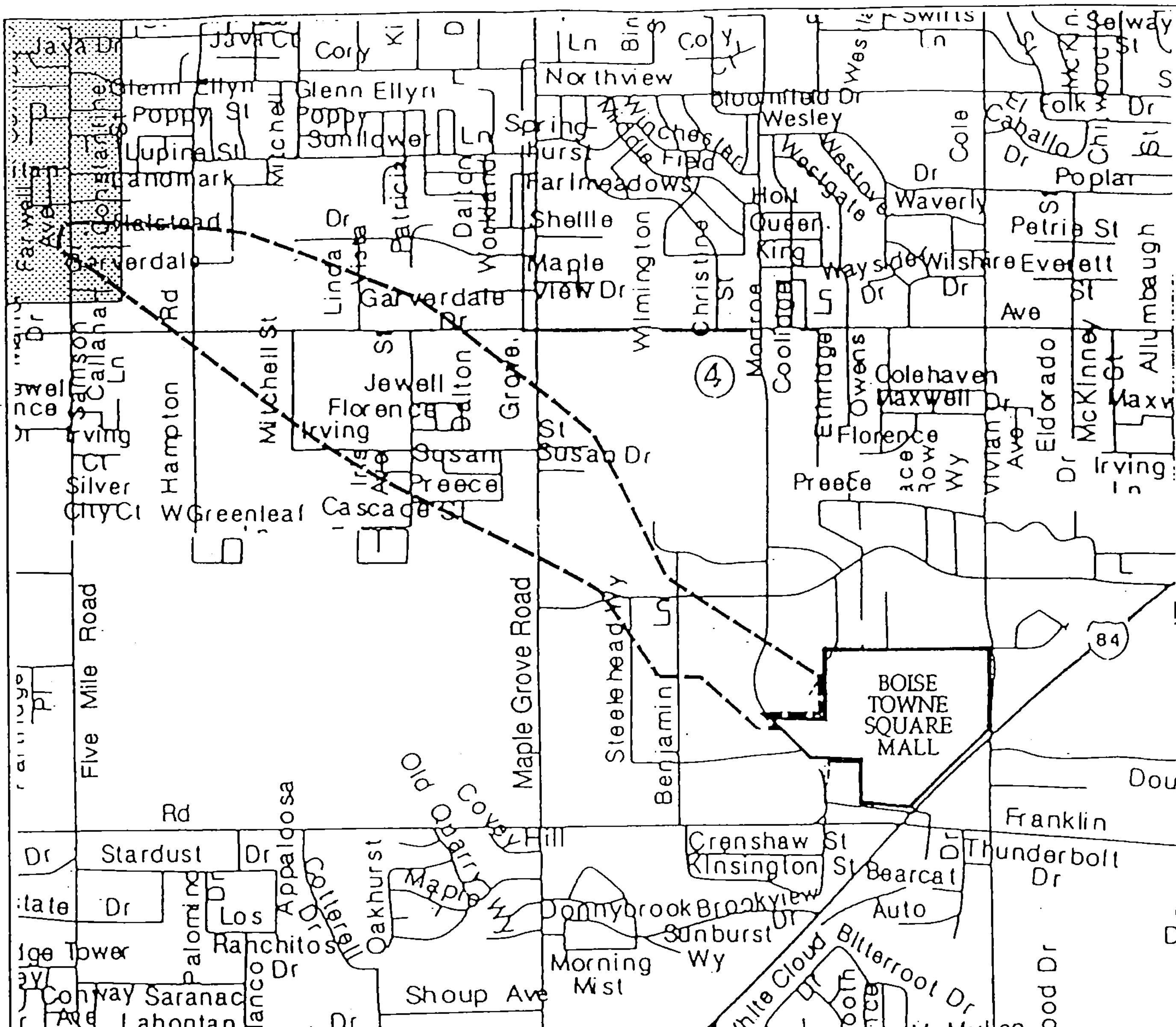
FIGURES



Reference: U.S. West Communications telephone book, Boise, Idaho, 1990-91.

EXPLANATION

Mall Investigation Area

Affected Area

Approximate Area Shown on Plate 2

0 0.5
APPROXIMATE SCALE IN MILES

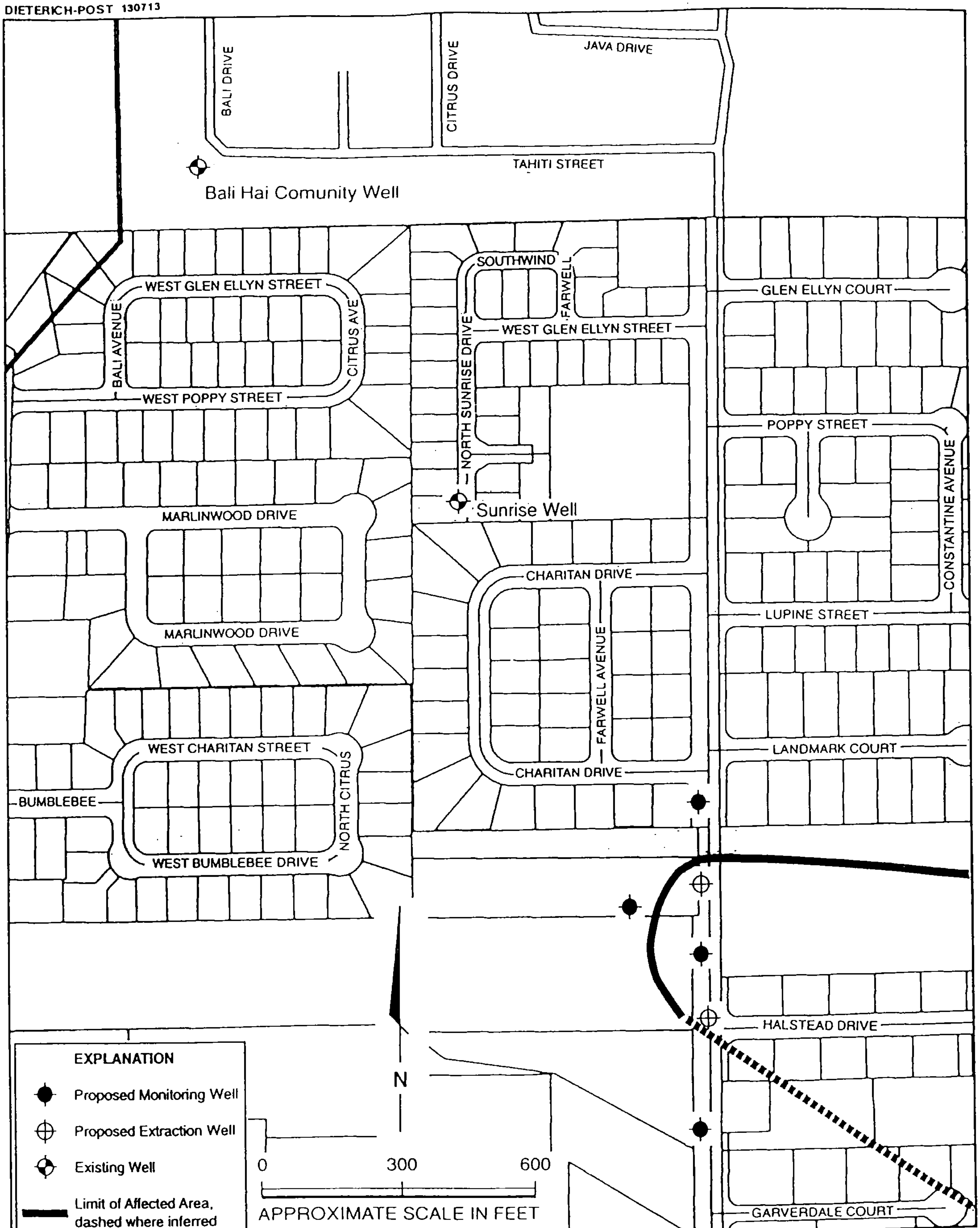
N

Harding Lawson Associates
Engineering and Environmental Services

Affected Area
PSA IRM Work Plan
Boise, Idaho

PLATE
1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
CSN	22947 02		6/94	



Harding Lawson Associates
Engineering and Environmental Services

Proposed Well Locations
PSA IRM Work Plan
Boise, Idaho

PLATE
2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
	22947 02		6/94	

FIGURE 3

PROJECT LEVEL SCHEDULE
BOISE, IDAHO - FIVE MILE ROAD SITE

DESCRIPTION	1994							1995		
	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR
Real Estate; Wells										
Site access agreement	<==	======>								
Move electrical pole	x									
Drill wells		<-------->								
Site escrow close				X						
Engineering										
Select civil engr'g firm	x									
Contract Engr'g firm	x									
Foundation, bldg design		<=======	====>							
Building const. permit			<=======	======>						
U/G pipe design		<----	---->							
U/G pipe const. permit			<-----------	--------->						
Process design	<-->		<-------->							
Procurement										
Building shell				<-------->						
Vessels				<-------->						
Pumps, mech. equip.				<-------->						
Electrical panel				<-------->						
Piping, fittings				<-------->						
Construction										
Select contractor				<---->						
Power to tmt. site					x					
Foundation, building					<======	===>				
Underground utilities						<-------->				
Treatment system						<=======	===>			
Startup								X		

Rev 01, 06/15/94

Note:

Critical Path <==>; X

Milestone x

Schedule subject to the assumptions stated in Section 10 0

APPENDIX A

LITHOLOGIC AND WELL CONSTRUCTION LOGS FOR THE SUNRISE WELL

TOP OF PVC CASING
Elevation __________

GROUND SURFACE

TOP OF CASING
below ground surface

10" DIA. BOREHOLE
0.0-40.0 ft

4" DIA. SCHED. 40 PVC
BLANK CASING
0.0 to 20.0 ft

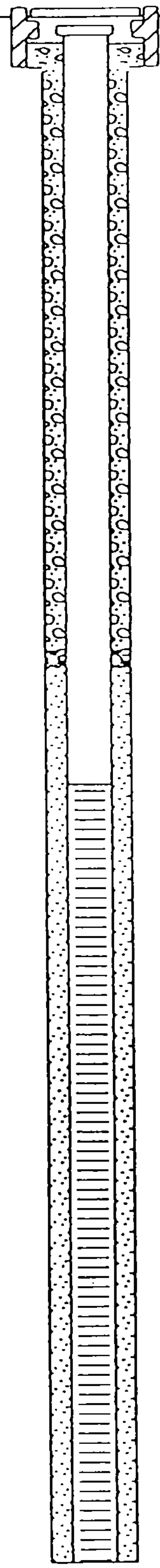
GRANULAR BENTONITE
SEAL 0.0 to 16.5 ft

BENTONITE PELLET SEAL
16.5 to 17.0 ft

SANDPACK
17.0 to 40.0 ft

4" DIA. SLOTTED PVC
SCREEN (0.010" slot size)
20.0 to 40.0 ft

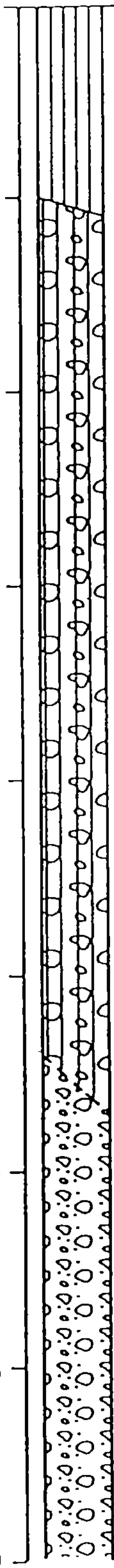
BOTTOM WELL CAP,
HOLE CLEANED OUT
to 40.0 ft



Equipment 10" O.D. Hollow Stem Auger

Elevation __________ Date 2-22-94

OVM Reading (ppm)	Hydropunch Sample	Depth (ft.)
		0
0.0		
		5
0.0		10
0.0		15
0.0	94-22-02-01	20
		25
	94-22-02-03	30
		35
	94-22-02-04	40



REDDISH BROWN SANDY SILT WITH CLAY (ML)
damp, low plasticity, trace 1/2" to 2" well rounded granitic cobbles

at 2 ft, grades to increased clay

at 4 ft, grades to gravelly clayey silt

REDDISH BROWN CLAYEY SILTY GRAVEL (GM)
medium to coarse, 1/2"- 3", very well rounded, mostly granitic in composition, no matrix - silty clay on individual cobbles

some 4" cobbles, mostly uniform 2 to 3", decreasing silt/clay, dry

well rounded cobbles, as above
granitic, 2 to 4", slightly silty, dry (gap-graded)

at 14 ft, slight overall decrease in average grain size, increase in 1 to 2" cobbles size, but no change in lithology

∇ water at 16.9 ft

well rounded gravels, 2 to 4" as above, trace silt mostly granitic

grades to interbedded coarse gravels and light brown fine- to medium-grained sand (GP)

well rounded gravels as above, wet, trace silt, cobbles 1.5 to 4"

gravels as above, wet

0022LZ

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring and Well Completion,
2212 N. Sunrise
January-March 1994 Quarterly Report
Van Waters & Rogers Inc.
Boise, Idaho

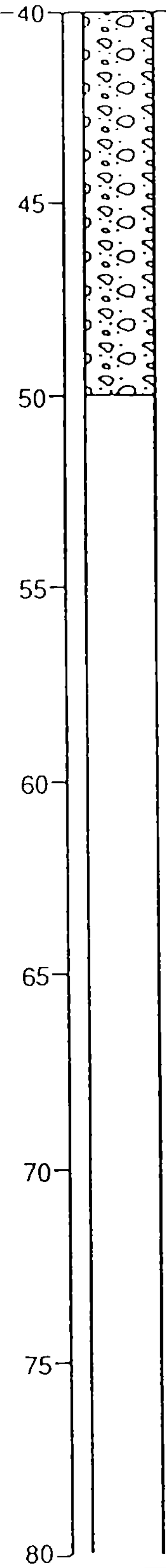
PLATE
A-1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
LZc	20783 0032		3/93	

Equipment 10" O.D. Hollow Stem Auger

Elevation ________ Date 2-22-94

OVM Reading (ppm)	Hydropunch Sample	Depth (ft.)	Sample	
0.0	94-22-02-05	50		bottom of boring at 50.0 ft



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Harding Lawson Associates
Engineering and Environmental Services

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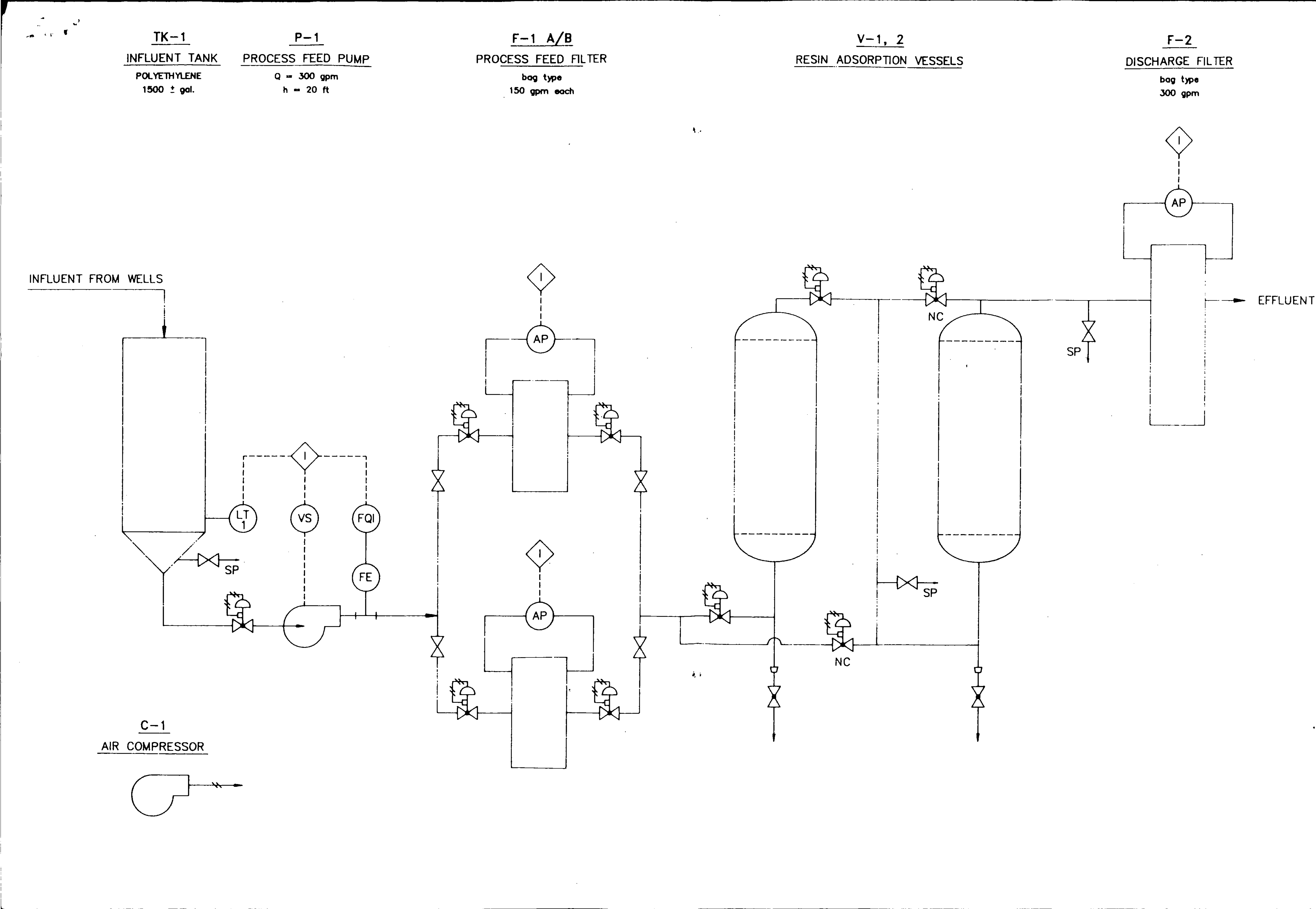
PLATE
A-1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
LZc	20783 0032		3/93	

DRAWINGS



J. POWELL & ASSOCIATES

drawing by

NORWEST DESIGN ENGINEERING

client: VAN WATERS & ROGERS INC.

project manager: MIKE GAUDETTE

project: BOISE TOWN MALL AND FIVE MILE ROAD

title: TREATMENT SYSTEM - PROCESS FLOW DIAGRAM

drawn by: GEORGE OLSEN

drawing no. 1